

**Notice of Allowability**

Application No.

10/789,940

Examiner

Jannelle M. Lebron

Applicant(s)

SHINKAWA ET AL.

Art Unit

2861

--The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to amendment filed 5/9/2006.
2. ☒ The allowed claim(s) is/are 1 and 6-20.
3. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) ☒ All    b) ☐ Some\*    c) ☐ None    of the:
    1. ☒ Certified copies of the priority documents have been received.
    2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
    3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
  5. ☐ CORRECTED DRAWINGS ( as "replacement sheets") must be submitted.
    - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review ( PTO-948) attached
      - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.
    - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☒ Information Disclosure Statements (PTO-1449 or PTO/SB/08),  
Paper No./Mail Date 2/24/04, 7/19/04, 7/20/04
4. ☐ Examiner's Comment Regarding Requirement for Deposit  
of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☐ Interview Summary (PTO-413),  
Paper No./Mail Date \_\_\_\_\_
7. ☐ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other \_\_\_\_\_

## DETAILED ACTION

### *Allowable Subject Matter*

1. Claims 1 and 6-20 are allowed.
2. The following is an examiner's statement of reasons for allowance:

- Claim 1:

The primary reason for allowance of this claim is the inclusion of the limitations of a droplet ejecting head comprising:

an ejection abnormality detecting device having a residual vibration detecting device wherein when the period of the residual vibration of the vibration plate is shorter than a predetermined first period, the determining device determines that the cause of the droplet ejection abnormality is that there is an air bubble mixed in its cavity.

It is these limitations, either alone or in combination as claimed, that have not been taught, found, or suggested by prior art.

- Claim 20:

The primary reason for allowance of this claim is the inclusion of the limitations of a droplet ejecting head ejection abnormality detecting method comprising the steps of:

determining that the cause of the droplet ejection abnormality is that there is a bubble mixed in a cavity when the period of the residual vibration of the vibration plate is shorter than a predetermined first period;

determining that the cause of the droplet ejection abnormality is that there is paper powder adhered to a vicinity of an exit of the nozzle when the period of the

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residual vibration of the vibration plate is longer than a predetermined second period but shorter than a predetermined first period, wherein the second period is longer than the first period and the third period is longer than the second period;

determining that the cause of the droplet ejection abnormality is that there is a thickened liquid in the vicinity of the nozzle when the period of the residual vibration of the vibration plate is longer than said predetermined third period.

It is these limitations, either alone or in combination as claimed, that have not been taught, found, or suggested by prior art.

- Claims 6-19:

These claims are allowable subject matter due to their dependency on base claim 1.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

### ***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Kanayama (US Patent 4,498,088) discloses an air bubble detecting system for detecting air bubbles contained in an inkjet liquid disposed in a printer head. The

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system includes a driver circuit for activating a piezoelectric transducer attached to a pressure chamber, thereby creating an initial oscillation in the ink liquid. The system further includes a sensing circuit for sensing a residual oscillation of the ink liquid after termination of the initial oscillation. When air bubbles are contained in the liquid, the vibration energy supplied from the piezoelectric transducer attached to the pressure chamber is absorbed by the air bubbles resulting in a high frequency component included in an output signal obtained by the sensing circuit.

Isayama (US Patent 4,034,380) discloses an ink ejection apparatus comprising means for detecting a lack of ink or air bubbles in an ink chamber thereof and means for detecting a volume of air in an ink chamber of an ejection head which is sufficient to prevent ink ejection and produce a signal indicating the same. The apparatus also comprises an electrostrictive plate to reduce the volume of an ink chamber upon application of an electrical pulse and means to increase the magnitude of the electrical pulse when a small amount of air is present in the chamber.

Yauchi et al (US Patent 5,500,657) discloses an air-bubble detection apparatus which detects the presence or absence of air bubbles in an ink channel by detecting the voltage which develops across an electrostrictive vibrator by mechanical strain as a result of the ink in the channel being moved.

Simons et al (US 2002/0089562) discloses a printing apparatus including at least one ink duct provided with an electromechanical transducer, a driver circuit provided with a pulse generator and operatively associated with the transducer to energize it, and a measuring circuit operatively associated with the transducer for measuring an

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electrical signal generated by the pulse generator, wherein measurement of the electrical signal takes place when the printing apparatus is in a printing mode.

Foster et al. (US Patent 6,375,299) discloses a fault detection circuit for a piezoelectric ink jet printer comprising a driver circuit for applying a test signal to the ejector and a digital signal processing means for receiving an output from a pre-processing circuit and for analyzing a frequency dependent impedance of the ink ejector. As impedance may shift with the presence of bubbles in the ink channel, faulty ink ejectors may be detected.

Fujii et al. (US Patent 5,818,473) discloses a drive method of an ink-jet head in which a diaphragm is deformed by means of electrostatic force to eject an ink droplet from a nozzle so as to prevent a residual charge from being created between a diaphragm and an individual electrode. A residual charge created between the diaphragm and the electrode can be removed concurrently with performing the operation of ink droplet ejection by applying positive and negative voltage pulses.


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jannelle M. Lebron whose telephone number is (571) 272-2729. The examiner can normally be reached on Monday thru Friday 8:30am-5:00pm.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen D. Meier can be reached on (571) 272-2149. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

JML  
05/11/2006

  
LAMSON NGUYEN  
PRIMARY EXAMINER  
05/11/06